



UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 6th Semester Examination, 2021

CC13-CHEMISTRY

INORGANIC

Full Marks: 40

ASSIGNMENT

*1 ne figures in the margin indicate full marks.
All symbols are of usual significance.*

Answer any four questions from the following

10×4 = 40

1. (a) Why is carbon monoxide known as π -acid ligand? How do you identify a bridging and terminal CO in the carbonyls? 1 $\frac{1}{2}$ + 1 $\frac{1}{2}$
- (b) Discuss the structure of $Mn_2(CO)_{10}$. 4
- (c) Using 18-electron rule: 2+1
 - (i) Predict the values of x in each of the following cases:
 $H_xCr(CO)_5$, $Rh(\eta^5-C_5H_5)(CO)_x$
 - (ii) Find the number of metal-metal bonds in $Co_4(CO)_{12}$.
2. (a) Describe the various group reagents used in qualitative inorganic analysis. What is the chemistry behind this selection? 3+1
- (b) What is Zeise's salt? Discuss briefly about the structure and bonding in Zeise's salt. 1+3
- (c) How is ferrocene converted to $(\eta^5-C_5H_5)Fe(\eta^5-C_5H_4COOH)$? 2
3. (a) How will you define an organometallic compound? Can the carbonyls be called organometallic compound? 1+1
- (b) Describe three important general methods for preparing organometallic compounds. 3
- (c) The carbonyl stretching frequency of $[Mn(CO)_6]^+$, $Cr(CO)_6$ and $[V(CO)_6]^-$ occurs at 2090, 2000 and 1860 cm^{-1} respectively. Give reasons for variation. 3
- (d) Give two examples of sigma-bonded organometallic compounds. 2
4. (a) Why interfering acid radicals are to be removed before Group IIIA analysis? 2
- (b) Why NH_4Cl is added before addition of NH_4OH for the precipitation of Group IIIA metal hydroxides? 3
- (c) Discuss the removal of phosphate by zirconyl nitrate method. 2 $\frac{1}{2}$
- (d) How does common ion effect influence the solubility of a sparingly soluble salt? Explain with an example. 2 $\frac{1}{2}$

5. (a) What is trans effect? Explain it with an example. 2
 (b) Write a short note on thermodynamic stability and kinetic stability of complexes. 3
 (c) Cyclopentadienyl ring in ferrocene has aromatic character but cyclopentadiene itself has no such property. Explain. 3
 (d) Which of the following is most easily reduced and why? 2

$$V(CO)_6, Cr(CO)_6, Fe(CO)_5, Ni(CO)_4$$
6. (a) Write a short note on hydroformylation. 3
 (b) How will you detect the presence of phosphate in an inorganic sample? Give the relevant chemical reaction. 3
 (c) Although NiS is insoluble it is not precipitated when H₂S gas is passed during Group II precipitation but is precipitated in ammoniacal medium. Explain. 3
 (d) At what pH phosphate separation is carried out by FeCl₃ method? 1
7. (a) Discuss the mechanism of nucleophilic substitution reaction in square planar complexes. 4
 (b) Ni²⁺ cannot show trans effect. Explain. 2½
 (c) Derive relationship between the stepwise formation constant and the overall formation constant. 2½
 (d) Define hapticity of organic ligands. 1
8. (a) Discuss the application of Ziegler Natta catalyst. 3
 (b) [Pt(NH₃)₂Cl₂] can be prepared in two ways: 3
 (i) through reaction of [Pt(NH₃)₄]Cl₂ with HCl and
 (ii) through reaction of K₂[PtCl₄] with aqueous NH₃.
 However, the products are not identical. What would you infer about the structures of these two Pt(II) complexes? Explain on the basis of trans effect.
 (c) Explain why acetylation of ferrocene is approx. 10⁶ times faster than that of benzene. 3
 (d) What is Wilkinson catalyst? 1

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